

PROJECT NUMBER: 0105
PROJECT TITLE: PHYSICAL CHEMISTRY OF SMOKE AND FILTRATION
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Sorption in Filters

Sorption of vapors on filter materials is of interest because it is a method for obtaining selective filtration. The fixed bed adsorption (FBA) method was used for systems of nicotine vapor and either untreated cellulose acetate (CA) or tobacco. Gas flow rate was used as an experimental variable and the data was treated by fitting a mathematical model adapted from chemical engineering theory. The model worked well with the nicotine-CA system but it was not internally consistent for the nicotine-tobacco system (1).

The gas chromatographic method of studying adsorption is being used with homologous series of chemical compounds in order to separate chemical group and structure effects. Experiments were done using CA columns and alkanes up to C₁₀. Adsorption correlates positively with carbon number and branching reduces adsorption on CA (2).

Baseline Studies and Mathematical Modelling

Puff-by-puff measurements of TPM, nicotine and water were carried out on Commander rods cut to different lengths. This was a repeat of the study reported last period with nicotine and water data obtained. The rod lengths were chosen to cover the increments normally consumed in one puff cycle. Data reduction and analysis is currently underway and will take considerable time to complete. Preliminary results show that water attains an equilibrium value about 40 mm behind the coal. Water delivery attains a maximum with 10 mm of tobacco left in the butt. Thus it appears that water is evolved in the 10 mm section behind the coal and then condensed in the section from 10 to 40 mm further on. No evidence of a build-up remaining from previous puffs through the tobacco rod could be seen in the data (3).

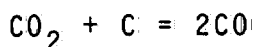
Isolation of Flavor Constituents

The pyrolytic decomposition of tobacco in a flowing stream of nitrogen is being studied with the hope shedding light on the sparging process and also on the processes that occur during combustion. The effect of nitrogen flow rate was studied during

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this period. Evidence was gathered to confirm the hypothesis that CO evolution approaches equilibrium values as the flow rate is reduced when the temperature is above 500°C. The equilibrium appears to be



Thus, there is no possibility of modifying the high temperature combustion process to reduce CO output if this equilibrium is the controlling step.

Exploratory

A CA column in a plastic sheath was coated with squalene and then used as a GC column to separate pentane and heptane. This work is being done to develop examples for a patent application covering filter materials used as chromatographic columns.

References

1. Simpson, Book 6219, pp. 1-78.
Simpson, Book 6215, pp. 85-100.
2. Dwyer, Book 5597, pp. 95-100.
Dwyer, Book 6308, pp. 1-5.
3. Stewart, Book 5559, pp. 50-53.
4. Osborne, Book 6143, p. 26.
Bebbs, Book 6120, pp. 72-89.

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